(12) UK Patent Application (19) GB (11) 2 283 360 (13) A

(43) Date of A Publication 03.05.1995

(21) Application No 9421792.4

(22) Date of Filing 28.10.1994

(30) Priority Data
(31) 9322193 (32) 28.10.1993 (33) GB

(51) INT CL[6]
G11B 27/034

(52) UK CL (Edition N)
G5R RB784 RB81

(56) Documents Cited
GB 2273220 A GB 2263577 A

(58) Field of Search
UK CL (Edition N) G5R RB81
INT CL[6] G11B 27/02 27/022 27/026 27/028 27/029 27/031 27/034 27/036

(71) Applicant(s)
Lightworks Editing Systems Limited

(Incorporated in the United Kingdom)

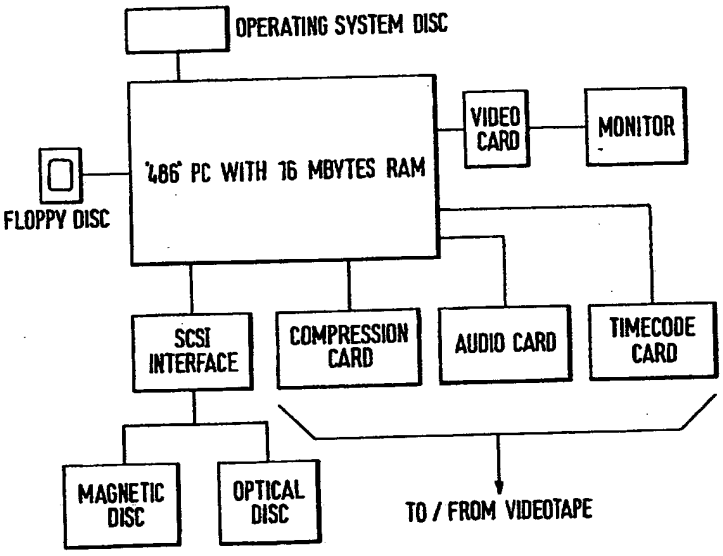
31-32 Soho Square, LONDON, W1V 6AP, United Kingdom

(72) Inventor(s)
Paul Bamborough

(74) Agent and/or Address for Service
Frank B Dehn & Co
Imperial House, 15-19 Kingsway, LONDON, WC2B 6UZ, United Kingdom

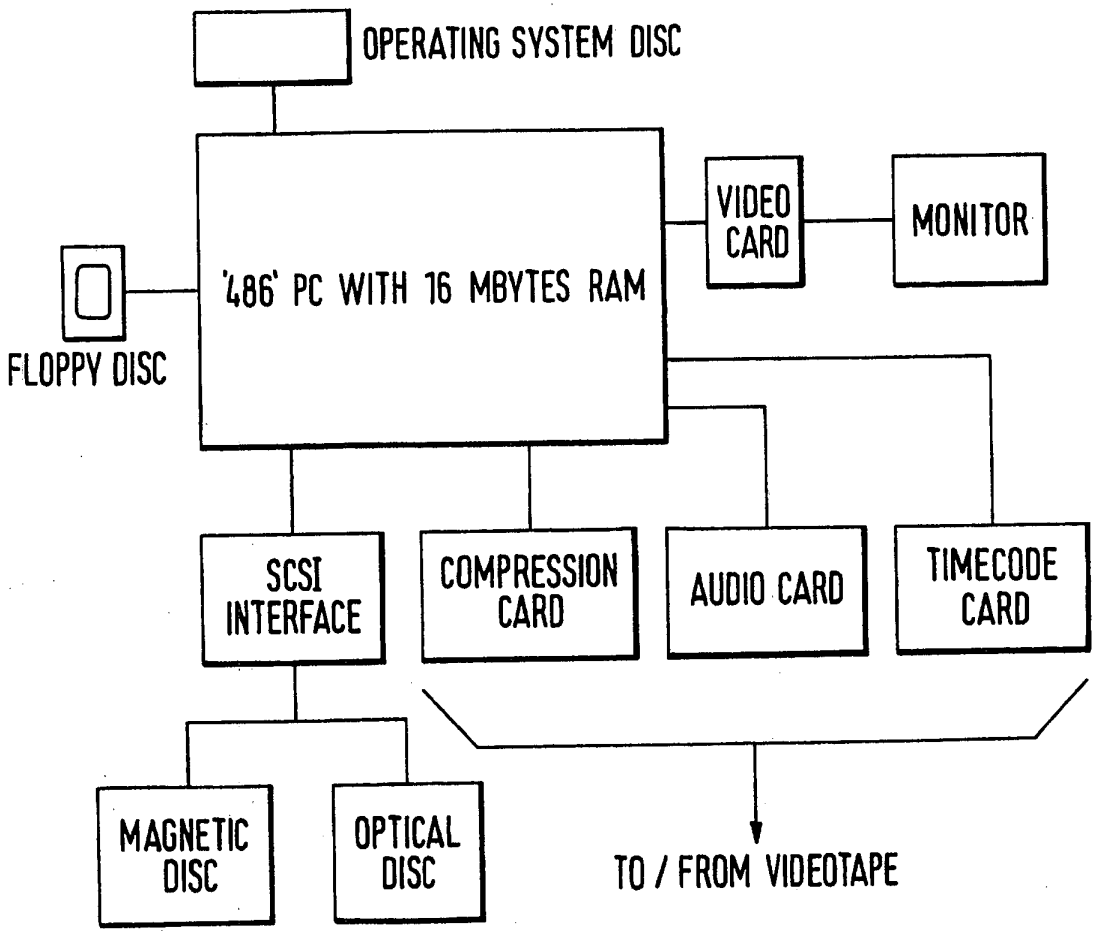
(54) Video editing system stores scene joins in fast media

(57) In editing together digitally recorded video scenes, the scenes are stored on optical media but the regions adjacent the joins between the scenes are recorded on faster response magnetic media to facilitate editing.



GB 2 283 360 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.


OPERATING SYSTEM DISC
'486' PC WITH 16 MBYTES RAM
VIDEO CARD
MONITOR
FLOPPY DISC
SCSI INTERFACE
COMPRESSION CARD
AUDIO CARD
TIMECODE CARD
MAGNETIC DISC
OPTICAL DISC
TO / FROM VIDEOTAPE

Video Editing Systems

This specification relates to video editing systems.

In the production of a work recorded on visual or audio-visual media, such as cinematographic films, video tapes, video discs and so forth, editing is required. To attain the overall work that the artistic director or producer wishes to achieve, it is usual to record the event or work with multiple cameras. This is done to achieve several different 'viewpoints'. After the shooting of the event, there is a creative phase of editing. This editing consists primarily of deciding where in the action to switch cameras. This 'switching' of cameras in the final medium is called a 'cut'. Also, works consist of normally more than one scene. Part of the artistic process of producing such a work is in choosing the order of scenes, together with deciding exactly where in the recorded action to 'cut into', or start and end a scene.

As a more advanced version of this, it may be decided by the director or producer to 'fade' either from one camera to another, or from one scene to another.

In many current systems an edit decision list is produced. This is a list setting out which clips from which source are to be put together in what order to make the final product. There will also be instructions as to fading and so forth. In the case of films, a film editor will work from a cut-list, cutting specified frames from appropriate reels of material and splicing them together as required. Separate information will be produced for "opticals" where optical printing is needed, say, to combine frames for a fade. This

'optical' information may well contain a list of film information that is required to be combined, together with mask information and other data. This is fully explained in Chapter 14 of Introduction to film editing by Bernard A. Balmuth, published by Butterwork Publishers, 80 Montvale Avenue, Stoneham, MA 02180, USA. ISBN 0-240-51717-2. In the case of video tapes it is known to supply the edit decision list in the form of computer software to equipment which will assemble a final video tape from various source tapes. There are many digital formats in which this can be stored, including the "CMX" editing format.

The end result is an artistic work on cinematographic film, video tape or other media, which is of "broadcast" quality; that is, the quality and resolution of the images is of the high standard appropriate to the ultimate playback system, be it a projector in a cinema, a tape to be broadcast by a television company, or a tape to be used as a master from which domestic quality tapes or video discs are produced.

It is inconvenient and unnecessary to work with broadcast quality media in the production of the edit list itself and indeed one object of using an edit list is that this is subsequently applied to the broadcast quality material. Accordingly, various "off line" systems have been developed. In these, lower resolution versions of the images are used by an editor to produce the edit decision list. In one early proposal, an editor would view and work with images from several video machines of nearer domestic than broadcasting quality. The tapes on these contained the same material - in terms of frames, time codes etc. as the original broadcast quality sources, but at a lower quality.

More recently, digital system have been developed. Such systems produce low resolution, often data-compressed, digitised representations of the original source material. The digitised representations are stored in fact access storage media such as magnetic disks, optical disks and so forth, and are manipulated in random access memory. In the case of cinematographic films, it is first transcribed into suitable video media by a telecine machine such as the Rank Cintel URSA or BTS FDL 90, before the low resolution images are made. Once the decisions have been made, the edit decision list is produced and typically this is in the form of a listing on a diskette. The diskette is used with an on-line video editing system to produce the final broadcast quality product. This process is known as conforming.

Such off-line systems have been produced by EMC, Avid and OLE Limited (Lightworks).

It will be appreciated that the advantage of using lower resolution images, perhaps compressed up to 50 or 100 times, is that the power of the equipment (and thus its cost) can be less, in terms of processing speed, memory, storage requirements and so forth. Nevertheless, the image quality is still good enough for editors to work with.

Even with data compression techniques such as JPEG, there is still a lot of data to be stored and the cost of storage media is still a major part of the overall system cost. Typically, storage is on magnetic hard disks which may have capacities of 2 Gb or more.

The problems are increasing as there are moves towards even higher resolution media. For example, High Definition Television ("HDTV") is planned. By way of example, a frame of material in an off line system - of

low resolution and compressed - may occupy 20 to 50 Kb. At conventional broadcast quality resolution the frame may occupy 1 Mb of storage space. With HDTV material, it would occupy 5 Mb of space. It is also proposed to use digitised film images at full cine resolution of eg. 3000 lines by 4000 pixels.

Thus even when working with standard resolution in an off line system there are serious demands on disk storage, and when using high resolution or an on line system the problems will be far greater. Of course, other storage systems exist which can store large amounts of data more cheaply than magnetic hard disks, but it is impossible to use tape other than as a backup device and there are even limitations with optical storage.

Optical disks, of the magneto-optical or phase change types, provide reasonably fast access times and data transfer rates for some applications and are significantly less expensive than hard disks. The costs may be about three times less per megabyte. However, they are still not suitable as a primary edit medium for a video editing system. The data rate is too low and they cannot be written to in real time, due to the limits of the physical processes which take place during writing. They can play back data to produce a real time picture stream if the picture segments are contiguous, but they have insufficient bandwidth to produce a real time picture stream from a random array of picture segments on the disk. Thus whilst optical disks may be used for long term storage of material, when editing is required the material is transferred to magnetic disk before the editing process can start. This takes time and, of course, the need for substantial magnetic disk storage space increases expense.

In a typical editing session, it may be desired to position scene twenty, for example, after scene one. This cannot be achieved from the optical disk as there is no bandwidth to transfer the data faster than the playout speed, to create enough time to move the heads of the drive to the area of the disk containing scene twenty. In a conventional system, therefore, all of scene one and all of scene twenty would be transferred to the magnetic disk.

It is therefore proposed to have a hybrid system in which the bulk of a scene is played out from an optical disk or other relatively slow response media, and critical parts of the scene only are copied onto the faster response media.

Thus, viewed from one aspect there is provided a method for editing together first and second video scenes, wherein at least the second scene is stored on relatively slow response media, a part of said second scene in the region of the join with the first scene is stored on relatively fast response media, and the result of the editing together of the two scenes is viewed by playing back the first scene, playing back the part of the second scene from the relatively fast response media, and playing back at least some of the remainder of the second scene from the relatively slow response media.

Thus the critical part of the second scene, which the editing operator will wish to consider carefully and adjust in the editing operation, is stored on fast response media such as a hard magnetic disk. The less critical part of the second scene is stored on the slower response media such as an optical disk. The result of the edit can be viewed in real time, but the optical disk is not required to deal with data transfer

in the critical region.

Preferably, the first scene is also stored on relatively slow response media. Preferably a part of the first scene in the region of the join with the second scene is stored on relatively fast response media. Thus the editor can adjust both scenes in the region of the join, with the benefit of fast access time and the ability to study the effects of the edits.

It will be appreciated that for the purpose of the invention it is irrelevant whether scene one is before or after scene two. The join region for at least one of the scenes is transferred to the hard magnetic disk or other suitable media.

In a practical system therefore, all scenes are stored on optical media. When an editing operative indicates that it is wished to edit, say, scene twenty onto the end of scene one, the system copies the first part of scene twenty onto magnetic disk and the last part of scene one. These parts could be, say one second regions, with the whole of a scene taking twenty seconds. Editing may then be carried out. The result of the edit will be shown by playing out most of scene one from optical disk, the last part of scene one and the first part of scene two from magnetic disk, and then the remainder of scene twenty from optical disk.

With such a system it necessary to have only one or two seconds of video stored on magnetic media. There will be a certain deadtime before editing can commence, as the appropriate data is transferred from the optical disk to the magnetic disk. However, in a conventional system using optical storage there would be a far greater deadtime as the whole of both scenes would be transferred to magnetic disk. Of course, the present

system could be used in such a manner in appropriate circumstances.

The danger of transferring only a minimum amount of data to magnetic media is that there will be limited flexibility in altering the edit, and in particular the point at which the transition takes place. However, by transferring data both at the end of one scene and at the start of the other, as in the preferred systems outlined above, adjustments can be made without having to copy more data from the optical media.

The system can be employed in conjunction with an existing system such as the "Lightworks" system, with e.g large capacity SCSI hard drives and magneto optical drives.

Such an 'Offline' editing system will typically consist of a general purpose microcomputer platform, with 'specialist' hardware added to allow it to perform the required tasks. In the case of AVID, an 'APPLE' computer is used, as supplied by Apple Inc., of Cupertino, California, USA. Depending on the AVID model used, this platform may vary from a Motorola 68030 based platform, such as one of the 'QUADRA' range, through to a 'Power Mac' 8100 model, based around the Power 603 chip, jointly developed by Apple, Motorola, and IBM.

In the case of a LIGHTWORKS system, an Industry standard IBM PC 'clone' is used. This will be of the '486' or Pentium generation, based around the Intel 80486 or Pentium Microprocessor, typically running at a clock speed of 66 or 90 Mhz. Typically a Minimum of 16 Mbytes of RAM are used. There will be an ISA bus, with a minimum of 6 expansion slots. The computer will be running the Microsoft MS-DOS operating system of version 5.0 or later. Disc storage systems will be connected to

this computer using the SCSI (Small Computer Systems Interface) protocol. The computer will also contain a removable 'floppy' diskette, typically the Panasonic model JU-257024P. The discs attached to the computer SCSI but will typically consist of two functions. The first of these are for the storage of computer programs, and for the operating system. Typically the disc used for this will be a Quantum Pro-drive LPS 105S, having a storage capacity of 105 Megabytes. The other class of storage discs are the 'material' discs, for the storage of the scenes to be edited. These consist of two technologies. The first, and more expensive of these is of the 'Micropolis Inc', of Chatsworth, California. Typical models are the Model 1924, of 2400 Megabytes capacity (2.4 Gbytes). The second, and cheaper but slower, of these is of the 'Optical' technology, such as any of the range produced from the Japanese 'Panasonic' supplier.

Into the computer platform, various other circuit boards need to be added in order to perform the required tasks. These include a mix of 'off the shelf' and proprietary cards. Typical 'off the shelf' computer cards will include a 'serial data' card, a SCSI controller card, a 'display' card, and a 'time code' card. Typical proprietary cards will include a 'graphics' card, to control the picture display, a 'compression card', to perform data compression at real time rates, and a 'sound' board, to digitise and store audio.

The accompanying figure illustrates schematically the hardware arrangement outlined above.

Claims

1. A method for editing together first and second video scenes, wherein at least the second scene is stored on relatively slow response media, a part of said second scene in the region of the join with the first scene is stored on relatively fast response media, and the result of the editing together of the two scenes is viewed by playing back the first scene, playing back the part of the second scene from the relatively fast response media, and playing back at least some of the remainder of the second scene from the relatively slow response media.

2. A method as claimed in claim 1, wherein the first scene is stored on relatively slow response media.

3. A method as claimed in claim 2, wherein a part of the first scene in the region of the join with the second scene is stored on relatively fast response media.

4. A method as claimed in claim 1, 2 or 3, wherein the relatively slow response media is optical storage media.

5. A method as claimed in claim 4, wherein the relatively fast response media is magnetic media.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

Application number
GB 9421792.4

Relevant Technical Fields

(i) UK Cl (Ed.N) G5R (RB81)

(ii) Int Cl (Ed.6) G11B 27/02,27/022,27/026,27/028,27/029, 27/031,27/034,27/036

Search Examiner
MR P J EASTERFIELD

Date of completion of Search
6 JANUARY 1995

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii)

Documents considered relevant following a search in respect of Claims :-
1 to 5

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
E,A	GB 2273220 A	(QUANTEL)	
A	GB 2263577 A	(ASAHI)	

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

This Page is Inserted by IFW Indexing and Scanning Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☑ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.
As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.